Exhibit X

Data-Over-Cable Service Interface Specifications
DOCSIS 2.0

Radio Frequency Interface Specification

CM-SP-RFIv2.0-I12-071206

ISSUED
SPECIFICATION

Notice

Cable Modem Termination System (CMTS) Cable modem termination system, located at the cable television system head-end or distribution hub, which provides complementary functionality to the cable modems to enable data connectivity to a wide-area network.

Cable Modem Termination System - Network Side Interface (CMTS-NSI) The interface, defined in [DOCSIS3], between a CMTS and the equipment on its network side.

Cable Modem to CPE Interface (CMCI) The interface, defined in [DOCSIS4], between a CM and CPE.

Carrier Hum Modulation The peak-to-peak magnitude of the amplitude distortion relative to the RF carrier signal level due to the fundamental and low-order harmonics of the power-supply frequency.

Carrier-to-Noise Ratio (C/N or CNR) The ratio of signal power to noise power in the defined measurement bandwidth. For digital modulation, CNR = E_s/N_0, the energy-per-symbol to noise-density ratio; the signal power is measured in the occupied bandwidth, and the noise power is normalized to the modulation-rate bandwidth. For video, the measurement bandwidth is 4 MHz.

CCCM CPE Controlled Cable Modem. Refer to the DOCSIS Cable Modem to Customer Premise Equipment Interface (CMCI) specification.

Channel The frequency spectrum occupied by a signal. Usually specified by center frequency and bandwidth parameters.

Chip Each of the 128 bits comprising the S-CDMA spreading codes.

Chip Duration The time to transmit one chip of the S-CDMA spreading code. The inverse of the chip rate.

Chip Rate The rate at which individual chips of the S-CDMA spreading codes are transmitted. (1280 to 5120 kHz)

Classifier A set of criteria used for packet matching according to TCP, UDP, IP, LLC, and/or 802.1P/Q packet fields. A classifier maps each packet to a Service Flow. A Downstream Classifier is used by the CMTS to assign packets to downstream service flows. An Upstream Classifier is used by the CM to assign packets to upstream service flows.

CM See Cable Modem.

CMCI See Cable Modem to CPE Interface.

CMTS See Cable Modem Termination System.

CMTS-NSI See Cable Modem Termination System - Network Side Interface.

Code Hopping Matrix A shifted version of the reference code matrix (see below) that is used when code hopping is employed to vary the codes used by each CM. The Code Hopping Matrix is either 128 rows by 128 columns (when all 128 codes are active) or is 127 rows by 128 columns (when less than 128 codes are active in the S-CDMA spreader-on frame). When less than 128 codes are active, Code 0 (all ones) is deleted from the matrix, but all remaining codes are still cycled through even if less than 127 codes are active in a frame.

Composite Second Order Beat (CSO) The peak of the average level of distortion products due to second-order non-linearities in cable system equipment.

Composite Triple Beat (CTB) The peak of the average level of distortion components due to third-order non-linearities in cable system equipment.

4 Functional Assumptions

This section describes the characteristics of cable television plant to be assumed for the purpose of operating a data-over-cable system. It is not a description of CMTS or CM parameters. The data-over-cable system MUST be interoperable within the environment described in this section.

This section applies to the first technology option referred to in Section 1.1 (1.1.1 Scope). For the second option, refer to Annex F.

Whenever any reference in this section to frequency plans or compatibility with other services conflicts with any legal requirement for the area of operation, the latter shall take precedence. Any reference to NTSC analogue signals in 6 MHz channels does not imply that such signals are physically present.

4.1 Broadband Access Network

A coaxial-based broadband access network is assumed. This may take the form of either an all-coax or hybrid-fiber/coax (HFC) network. The generic term "cable network" is used here to cover all cases.

A cable network uses a shared-medium, tree-and-branch architecture with analog transmission. The key functional characteristics assumed in this document are the following:

- Two-way transmission.
- A maximum optical/electrical spacing between the CMTS and the most distant CM of 100 miles in each direction, although typical maximum separation may be 10-15 miles.
- A maximum differential optical/electrical spacing between the CMTS and the closest and most distant modems of 100 miles in each direction, although this would typically be limited to 15 miles.[1]

At a propagation velocity in fiber of approximately 1.5 ns/ft, 100 miles of fiber in each direction results in a round-trip delay of approximately 1.6 ms. For further information, see VIII.[2]

4.2 Equipment Assumptions

4.2.1 Frequency Plan

In the downstream direction, the cable system is assumed to have a passband with a lower edge between 50 and 54 MHz and an upper edge that is implementation-dependent but is typically in the range of 300 to 864 MHz. Within that passband, NTSC analog television signals in 6-MHz channels are assumed to be present on the standard, HRC or IRC frequency plans of [EIA-S542], as well as other narrowband and wideband digital signals.

In the upstream direction, the cable system may have a subsplit (5-30 MHz) or extended subsplit (5-40 or 5-42 MHz) passband. NTSC analog television signals in 6-MHz channels may be present, as well as other signals.

1. Phrase "in each direction" added to second and third bulleted items per RFI2-N-02104 by RKV on 10/28/02.

2. Section 4.1, last paragraph added per RFI2-N-02104 by RKV on 10/28/02.